

storage have largely disappeared. For the rapid reproduction of maps photozincography was, until a few years ago, the method invariably used. Two new methods have now superseded photozincography; one of these, "heliozincography," was worked out by the Ordnance Survey, and subsequently adopted by the Survey of India; the other, the "Vandyke process," was invented by Mr. Vandyke, of the Survey of India, and has now been adopted by the Ordnance Survey. The first method consists in reproduction direct on a sensitised zinc plate in contact with a reversed negative. The Vandyke process consists in reproduction direct on a sensitised zinc plate in contact with the original drawing. Lately, at Southampton, it has been even found possible to reproduce maps drawn on thick drawing paper. The process has been patented by Mr. Vandyke, and is a cheap and very efficient means of reproducing cadastral maps.

(2) *Geodetic Triangulation in Burma.*—The principal point to note is the determination of the coefficient of terrestrial refraction by night as well as by day, the coefficient being the absolute refraction divided by the terrestrial arc. By day (from observations to heliostats between noon and 3 p.m.), the coefficient was 0.072; by night (from observations to lamps), 0.083. It is possible that if the night observations had been taken from midnight onwards the coefficient would have been smaller.

Some interesting secondary triangulation (the Manipur series) was also carried out, one of the rays being 95 miles long.

(3) *Latitude Operations.*—The average probable error of 14 latitudes observed with a zenith telescope was ± 0.063 , or say six and a half feet. India is, of course, committed to the system of refined latitudes, and comparatively few of them.

(4) *Experiments with the Jäderin Base Apparatus.*—A base was measured at Dehra Dun with the following results:—

By Jäderin apparatus...	39,187.272	feet
By Colby's bars	39,187.462	"

a discrepancy of 1/194,000.

It was found that the 80 ft. wire was the most convenient, and various practical suggestions are made on the use of the apparatus. It was apparently in contemplation to measure a Jäderin base in Burma. There would appear to be no doubt as to the gain in speed, and also no doubt that it is possible under suitable conditions to do away with base-line figures by the use of, say, 15 mile bases.

(5) *Magnetic Survey of India.*—This has been commenced, and there are now five base stations, Calcutta, Bombay, Rangoon, Dehra Dun, and Kodaikanal. It was intended in 1901 to send out three field detachments to work in an area west of a line joining Dehra Dun and Bombay, two to work along railway lines, and a third in the desert.

(6) *Tidal and Levelling Operations.*—Tidal observations have been, or are being, taken at forty-one ports in, and adjacent to, the Indian Empire. Tables are given of the tidal constants at various ports deduced from the 1900 observations. As regards the accuracy of prediction, at fourteen open coast stations during 1900 it was found that the mean error of prediction of the time of high or low water was thirteen minutes, and the average error of predicted heights was one twenty-fifth of the range.

The tide-predicting machine belonging to the Indian Government (due, it is believed, to Lord Kelvin and Mr. Roberts) is in London, and the Survey of India sends home annually the latest values of the tidal constants to Mr. Roberts, who sets the instrument for the port in question, and causes it to describe graphically

the tide curve for any future year required. As Prof. Darwin has remarked in his book on "The Tides," it is characteristic of England that this admirable machine has not been made use of for any of the home ports.

(7) *Topographical Surveys.*—The seventh report deals with some details of one-inch work in Burma, and incidentally serves to emphasise the necessity of keeping cadastral and topographical work distinct. The topographical surveys are fully described in the annual report, the most interesting being the survey on a scale of half inch to one mile of 17,000 square miles carried out in China during the expedition.

When shall we have an Imperial Survey capable of doing for the Crown colonies, protectorates and occupied territories what the Survey of India does for India?

C. F. C.

ISAAC COOKE THOMPSON.

LIVERPOOL has lost a well-known naturalist in the death of Mr. I. C. Thompson, who was hon. treasurer of the Liverpool Marine Biology Committee from its foundation nearly twenty years ago. He had a wide knowledge of the Crustacea, and especially of Copepoda, the group upon which most of his original work was done, but he was also a keen field-naturalist, interested in the lives and habits of his animals, and preferring to catch the specimens himself and to examine them in the first place alive. He was always a prominent member of the party during the dredging expeditions in the Irish Sea and at the Port Erin Biological Station. Little more than a month before his death he was one of the leaders in the British Association dredging excursion which followed the Southport meeting.

Thompson's early papers on the Copepoda dealt with the forms found in Liverpool Bay and other parts of the Irish Sea, but he collected wherever he went, and, as the result of vacation travels, published papers on the Mediterranean and Norwegian species and on collections from Madeira, the Canaries, the west coast of Ireland, the Færöe Channel, and a traverse through the North Atlantic to Quebec. He also described Copepoda from the Bay of Bengal, the Antarctic, the Red Sea and east coast of Africa, and recently from the *Oceana* Expedition in the North Atlantic. In these papers he described many new forms, aided in the elucidation of not a few obscure points, and greatly extended our knowledge of the geographical distribution of the group. Thompson's last piece of scientific work was a large report, undertaken jointly with Mr. Andrew Scott, upon the Copepoda of the Ceylon pearl banks, recording more than 280 species, of which 76 are described as new to science. This extensive work was completed some weeks ago, and Thompson passed the last of his sheets for press shortly before he was struck down; it has been referred to by one who saw the proofs as the pioneer work on tropical Harpacticidae and Lichomolgidae. Thompson's papers have been published for the most part in the *Transactions* of the Liverpool Biological Society, the *Journal* of the Linnean Society, the *Annals and Magazine of Natural History*, and the reports of the British Association. He was in correspondence with Claus, Richard, Giesbrecht, and other Continental workers, and frequently supplied them with British specimens required for comparison or description in their monographs.

There were few of the local organisations in Liverpool for the advancement of science and the applications of scientific teaching in which Mr. Isaac Thompson did not play a prominent part, and his posi-

tion, even twenty years ago, was fitly indicated by his selection, in April, 1882, to attend Darwin's funeral in Westminster Abbey as the representative of the Liverpool scientific societies. On the occasion of the last visit of the British Association to Liverpool, in 1896, Thompson was one of the local secretaries, and his colleagues can testify how well he did his share of the hard work, and how much the success of that large meeting depended upon his admirable business arrangements and careful attention to detail. He was a fellow of the Linnean Society and a regular and active member of Section D at British Association meetings. He was one of the founders of the Liverpool Biological Society and the L.M.B.C., and it was in connection with the latter, and during the last fifteen years, that most of his original scientific work was done.

Isaac Thompson was a good example of the serious amateur who does sound systematic work and makes lasting contributions to science. His loss will be keenly felt, not only in Liverpool, but by the large number of scientific men throughout the country who were his personal friends. We all admired his sterling, upright character and his sympathetic loving nature.

W. A. H.

NOTES.

PROF. J. H. VAN 'T HOFF and Dr. Robert Koch have been elected honorary members of the Vienna Academy of Sciences. Sir William Ramsay, Prof. G. B. von Neumayer, Prof. H. Poincaré, Prof. E. J. Marey, and Prof. K. Golgi have been elected foreign correspondents of the same Academy.

THE death is announced of Prof. Robert H. Thurston, of Cornell University, at the age of sixty-four. From 1866 to 1871 Prof. Thurston occupied the chair of natural philosophy at the United States Naval Academy. Subsequently he became professor of engineering at Stevens Institute, where he remained until he proceeded to Cornell, in 1885, as professor of mechanical technology.

DR. EINAR LÖNNBERG has been appointed director of the zoological department of the Museum of Gothenburg.

REUTER reports that two earthquake shocks were felt at Shuraz, Persia, on the night of November 14.

MR. W. J. PALMER, a graduate of the Ontario Agricultural College, has been appointed director of agriculture in the Orange River Colony at a salary of 1200*l.* per annum.

THE sixth International Congress of Applied Chemistry is to be held at Rome in 1906. Prof. E. Paterno, of Rome, has been elected president of the organising committee.

IT is stated by *La Nature* that the body of a Tyrolean guide who fell into a crevasse on the glacier of Grossvenediger, in the Austrian Alps, thirty years ago, has been found in a remarkable state of preservation at the foot of the glacier.

A MONUMENT to the brothers Haüy was unveiled at their birthplace, Saint-Just-en-Chaussée (Oise), on November 8. The elder brother, René Just Haüy, who died in 1822, was the eminent mineralogist. The ceremony was presided over by M. Edmond Perrier.

AT a meeting of the Royal Statistical Society held on Tuesday, the president, Major P. G. Craigie, C.B., delivered his opening address. Before doing so he presented, on behalf of the council and the society, a Guy medal in silver to M. Yves Guyot, for his paper on "The Sugar

Industry of the Continent," which was read before the society on May 29, 1902.

THE Craggs research prize, for the best piece of original work done during the current year by present or past students of the London School of Tropical Medicine, has been awarded to Dr. Aldo Castellani for his researches into the etiology of sleeping sickness. Dr. Travers has been awarded honourable mention for his paper "Beri-Beri."

COMMANDER PEARY was, on November 12, in Edinburgh, presented with the Royal Scottish Geographical Society's Livingstone gold medal. Previous awards of the medal were to Sir Harry Johnston for discoveries in Africa, and to Dr. Sven Hedin for exploration in the central region of the Ural-Asian continent.

MR. M. H. MAW, of Walk House, Barrow-on-Humber, states that the radiant point of meteors seen by him in the early hours of Monday seemed to be about ten degrees south of the zenith. Meteors under the Pole Star seemed to move vertically down through 30° in about half a second. Taking the altitude of such a meteor to be eighty miles, the length of the arc described in half a second would be forty-two miles if the motion were at right angles to the line of sight.

A REUTER telegram from Rome reports that experiments made by the Italian naval authorities with a new system of radio-telegraphy originated by Prof. Alessandro Artom have conclusively proved that the new system enables electric waves to be transmitted in a given direction. The Minister of Marine has instructed Lieutenant Pullino, director of the wireless telegraph station of Monte Mario (Rome), to give every assistance in further experiments with the Artom system.

THE Times reports that the expedition to Tibet, under Captain Rawling and Lieutenant Hargreaves, of the Somerset Light Infantry, which left Leh in Ladak last May, arrived in Kashmir territory on October 4. Triangulation was extended as far as longitude 85° E., the highest latitude being 35° 45', and lowest 32° 45'. Many new lakes were discovered, the largest having an area of 70 square miles. One hundred points were fixed by triangulation, and latitudes of all the camps by astronomical observations; 38,000 square miles of country were surveyed.

THE following prizes have been awarded by the council of the Royal Society of Edinburgh:—(1) the Keith prize for 1899-1901 to Dr. Hugh Marshall for his discovery of the persulphates, and for his communications on the properties and reactions of these salts, published in the *Proceedings* of the Society; (2) the Makdougall-Brisbane prize for 1900-1902 to Dr. Arthur T. Masterton for his paper entitled "The Early Development of *Cribrella oculata* (Forbes), with remarks on Echinoderm Development," printed in vol. xl. of the *Transactions* of the Society. The prizes will be presented at the meeting of the Society on December 7.

A CORRESPONDENT of the *Times* reports that on November 12 a balloon belonging to MM. Lebaudy, and called *Le Jaune*, started from Moisson, about 55 kilometres from Paris, at 9.10 a.m., arrived at the Eiffel Tower at 10.50 a.m., and effected its descent on the Champ de Mars. According to M. Juchmès, an aéronaut and one of two passengers, the balloon encountered at first a south-south-west wind travelling at the rate of six metres a second. Almost the whole way he had to keep the point of the balloon somewhat to the right of the direction he intended to take. The maximum altitude attained was 300 metres, but the average was about 100.